



SAMLEX®

20 Years focused on power inverters

VR Series

POWER INVERTER

OWNER'S MANUAL

For models:

VR175..... 175W

VR250..... 250W

VR400..... 400W



With Advanced Technology!!!

THIS MANUAL CONTAINS IMPORTANT INFORMATION REGARDING SAFETY, OPERATION, MAINTENANCE AND STORAGE OF THIS PRODUCT. BEFORE USE, READ AND UNDERSTAND ALL CAUTIONS, WARNINGS, INSTRUCTIONS AND PRODUCT LABELS, PLUS YOUR VEHICLE'S BATTERY MANUFACTURER GUIDELINES. FAILURE TO DO SO COULD RESULT IN INJURY AND/OR PROPERTY DAMAGE.

IMPORTANT SAFETY INSTRUCTIONS

To ensure reliable service, your power inverter must be installed and used properly. Please read the installation and operating instructions thoroughly prior to installation and use. Pay particular attention to the WARNING and CAUTION statements in this manual. The CAUTION statements advise against certain conditions and practices that may result in damage to your inverter. The WARNING statements identify conditions or practices that may result in personal injury. ***Read All Instructions Before Using This Power Inverter!***

WARNINGS:

TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, EXPLOSION OR INJURY:

1. Do not connect to AC distribution wiring.
2. Remove appliance plug from outlet strip or turn off inverter before working on the appliance. Multiple outlet power strips with switches and circuit breakers only interrupt power to the "hot" receptacle terminals. The "neutral" terminals remain powered with respect to the "ground" terminals.
3. Do not make any electrical connections or disconnections in areas designated as IGNITION PROTECTED. This includes 12 volt DC cigarette plug connections, and terminal connections.
4. This is not a toy - keep away from children.
5. DO NOT install object into air vents.

CAUTIONS:

1. Do not use with positive ground electrical systems (the majority of modern automobiles, RVs, trucks and boats are negative ground). Reverse polarity connection will result in a blown fuse and may cause permanent damage to the inverter.
2. This inverter will not operate high wattage appliances over the output power limit or surge power limit.
3. Grounding the neutral will cause the inverter to shut down. Do not operate this inverter if it is wet. Do not install in engine compartment – install in a well ventilated area.
4. This inverter is not tested for use with medical devices.

IMPORTANT CABLE INFORMATION

Substantial power loss and reduced battery operating time results from inverters installed with cables that are not able to supply full power. Symptoms of low battery power can result from cables that are either excessively long or an insufficient gauge. The installer/operator should be especially aware of the requirements to maintain **secure, tight, water-resistant** electrical connections and to provide for strain relief for DC cables and appliance wiring. Cable insulation must be the appropriate type for the environment.

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1 · INTRODUCTION

Your new SAMLEX VR-Series power inverter is one in a series of the most advanced DC to AC inverters available today. With proper care and appropriate usage, it will give you years of dependable service in your car, truck, RV or boat.

VR series inverters are designed with a universal protection circuit that provide added safety features include automatic shutdown, earth fault protection and a low battery alarm to prevent damage to your battery.

This power inverter is configured with the latest low interference technology (**L.I.T.**), Universal Protection Circuit (**UP-Circuit**) and **Soft Start circuit** to improve inverter operation.

UP-Circuit provides full automatic inverter and battery protection. This includes overheat protection, battery protection, overload protection, short circuit protection and earth fault protection.

L.I.T. greatly improves the interference problems of common power inverter. Before introduction of L.I.T., signal interference may occur on TV pictures, audio system or radio equipments. Now you can enjoy a clean and powerful AC source!

Soft Start Circuit provides three major features. First, gradual voltage ramp-up during inverter start-up. This eliminates failed cold starts under load. Second, output that momentarily dips in voltage and quickly recovers. This eliminates most shutdowns from momentary overloads. Last, the inverter automatically re-starts when an overload that caused inverter shutdown is removed.



Compact Design



L.I.T.
Low Interference Technology



Universal Protection
Circuit

Thermal
Battery
Overload
Short circuit
Earth fault



Soft
Start



Turbo
Cooling



High
Efficient

2 · CONTROLS, INDICATORS AND CONNECTORS

Figure 1 & 2 detail the front & back panel of the inverter. The front panel provides two LED indicators. A green LED shows proper operation when lit. The red LED shows inverter shutdown from overload, over voltage or over temperature. Power is supplied through one worldwide universal outlet. The outlet accommodates either two or three pin AC plugs. An ON/OFF switch turns the inverter circuitry ON and OFF. The switch is used to force reset of inverter circuits if it is switched OFF, then ON.

FIGURE 1:



ONE Universal AC Outlet

ON/OFF SWITCH

Red LED → FAULT

Green LED → POWER

FIGURE 2:



(+) DC Power Connection
[400W Only]

(-) DC Power Connection
[400W Only]

Turbo Cooling Fan

12V DC PLUG

Parts for 175W & 250W
Optional parts for 400W

FIGURE 3:
175W AND 250W



3 · HOW YOUR INVERTER WORKS

The inverter converts low voltage DC (Direct Current) from a battery or other power source to standard 230 volt AC (Alternating Current) household power.

3.1 PRINCIPLE OF OPERATION

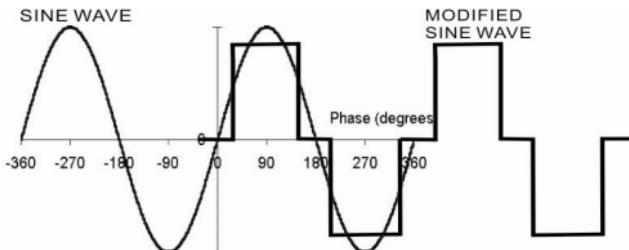
The inverter converts power in two stages. The first stage is a DC to DC conversion process that raises the low voltage DC at the inverter input to 280 volts DC. The second stage is the actual inverter stage that converts the high voltage DC into 230 volts, 50 Hz AC(rms). The DC-to-DC converter stage uses modern high frequency power conversion techniques that have replaced the bulky transformers found in less technologically-advanced models. The inverter stage uses advanced power MOSFET transistors in a full bridge configuration.

3.2 THE OUTPUT WAVEFORM

The AC output waveform of the VR-series inverter is known as "modified sine wave". It is a waveform that has characteristics similar to the sine wave shape of utility power. This type of waveform is suitable for most AC loads, including linear and switching power supplies used in electronic equipment, transformers, and motors. (See Figure 4).

The modified sine wave produced by the VR175/VR250/VR400 inverter has an RMS (root mean square) voltage of 230 volts, which is the same as standard household power. Most AC voltmeters (both digital and analog) are sensitive to the average value of the waveform rather than the RMS value. They are calibrated for RMS voltage under the assumption that the waveform measured will be a pure sine wave. These meters will not read the RMS voltage of a modified sine wave correctly. They will read about 20 to 30 volts low when measuring the output of the inverter. For accurate measurement of the output voltage of this unit, use a true RMS reading voltmeter such as a Fluke 87III, Fluke 8060A, Fluke 77/99 series or Beckman 4410.

FIGURE 4: Modified Sine Wave and Sine Wave Comparison



4 · INSTALLATION / ENVIRONMENTS

4.1 POWER SOURCE REQUIREMENTS

The power source must provide between 10.5 and 15.5 volts DC and must be able to supply the necessary current to operate the load. The power source may be a battery or a well-regulated DC power supply. To obtain a rough estimate of the current (in amperes) the power source must deliver, simply divide the power consumption of the load (in watts AC) by 10.

Example: If a load is rated at 100 watts AC, the power source must be able to deliver: 100 divided by 10=10 amperes

CAUTION: The SI-A2-VR175/VR250/VR400 must be connected only to batteries with a nominal output voltage of 12 volts. The unit will not operate from a 6 volt battery, and will sustain permanent damage if connected to a 24 volt battery.

4.2 CONNECTION TO POWER SOURCE

The 175W & 250W inverters come equipped with a 12 volt DC plug for connection to the power source: [Figure 3]

CAUTION: Do not use with positive ground electrical systems. (The majority of modern automobiles, RVs, and trucks are negative ground).

CONNECTING TO POWER SOURCE USING 12 VOLT DC PLUG:

The 12 volt DC plug is suitable for operating the inverter at power outputs up to 175 watts. The tip of the plug is positive and the contact is negative. Connect the inverter to the power source by inserting the 12 volt DC plug (cigarette plug) firmly into the 12 volt DC socket of a vehicle or other DC power source.

CAUTION: Connect directly to power source when operating above 175 watts.

NOTE: Most automobile 12 volt DC circuits use fuses rated at 15 to 20 amps or greater. To operate at full 175 watts output, make sure the DC power source can deliver 20 amps. A 15 amp circuit can only deliver 150 watts from the inverter.

CAUTION: Loose connectors may cause overheated wires and melted insulation. Check to make sure you have not reversed the polarity. Reverse polarity connection will result in a blown fuse and may cause permanent damage to the inverter.

For VR250 / VR400:

CONNECTING TO A POWER SOURCE USING PROVIDED CABLES:

If the inverter is to be used for extended periods at power levels above 175 watts, direct connection to the power source is required. Use the provided cables to connect the VR250/VR400 directly to the 12 volt power source using the following guidelines:

1. Check to be sure the inverter power switch is turned off and that no flammable fumes are present.
2. Connect the black cable to the black post marked “(-)” on the back of the inverter. Connect the battery clip to the negative terminal of the battery.
3. Connect the red cable to the red post marked “(+)” on the back of the inverter. Connect the battery clip to the positive terminal of the battery.
4. Check to be sure that all connections between battery clips and terminals are secure and tight.

Use # 10 AWG wire if the inverter to power source connection is 4meters or less. For longer cable lengths use #8 AWG wire. In either case, protect the positive (+) wire from shorts by installing a fuse or circuit breaker close to the DC power source (battery) terminal. The fuse should choose 30A for VR250, 50A for VR400.

1. Check to be sure the inverter's power switch is turned off and that no flammable fumes are present.
2. Identify the positive (+) and negative (-) DC power source (battery) terminals.
3. Install a fuse holder or breaker close to the positive (+) terminal of the DC source (battery).
4. Connect a length of wire on one side of the fuse holder or circuit breaker. Connect the other end if the wire to the positive (+) terminal of the inverter.
5. Connect a length of wire between the inverter's negative (-) terminal and the DC power source negative (-) terminal.
6. Connect a short length of wire to the other terminal of the fuse holder or circuit breaker. Mark it “POSITIVE” or “+”.
7. Connect the free end of the fuse or breaker wire to the positive terminal of the DC power source (battery).
8. Insert a 30/50A fuse in the fuse holder.
9. Check to be sure that all connections between battery clips, terminals and fuse are secure and tight.
10. Test the inverter by turning it on and plugging in a 100 watt lamp or equipment.
11. If the inverter is not properly operating, then refer to the troubleshooting sections of this manual.

CAUTION: Loose connectors may cause overheated wires and melted insulation.

4.3 CONNECTION TO LOAD

The inverter is equipped with a universal AC power receptacle. Plug the cord from the equipment you wish to operate into the AC receptacle. The green LED indicator lights to indicate that the inverter is functioning. Make sure the combined load requirement of your equipment does not exceed inverter's output rating.

The inverter is engineered to be connected directly to standard electrical and electronic equipment in the manner described above. Do not connect the power inverter to household or RV AC distribution wiring. Do not connect the power inverter to any AC load circuit in which the neutral conductor is connected to ground (earth) or to the negative of the DC (battery) source.

WARNING: Do not connect to AC distribution wiring.

CAUTION: RECHARGEABLE APPLIANCES

Certain rechargeable devices are designed to be recharged by plugging them directly into an AC receptacle. These devices may damage the inverter. Do not use the inverter to recharge items that can be plugged directly into an AC receptacle.

This problem does not occur with the majority of battery-operated equipment. Most of these devices use a separate charger or transformer that is plugged into an AC receptacle. The inverter is easily capable of running most chargers and transformers.

4.4 PLACEMENT OF INVERTER

For best operating results, the inverter should be placed on a flat surface, such as the ground, car floor, or other solid surface. The power cord allows easy positioning of the inverter. The inverter should only be used in locations that meet the following criteria:

DRY - Do not allow water and/or other liquids to come into contact with the power inverter.

COOL – Ambient air temperature should be between 30 degrees F (-1 degree C) non-condensing, and 105 degrees F (40 degrees C). Do not place the inverter on or near a heating vent or any piece of equipment which is generating heat above room temperature. Keep the inverter away from direct sunlight, if at all possible.

VENTILATED – Keep the area surrounding the inverter clear to ensure free air circulation around the unit. Do not place items on or over the inverter during operation. A fan is helpful if the inverter is operating at maximum power outputs for extended periods of time. The unit will shut down if the internal temperature exceeds operating temperatures. The unit will restart after it cools.

SAFE – Do not use the inverter near flammable materials or in any locations that may accumulate flammable fumes of gases.

5 · OPERATING TIPS

5.1 RATED VERSUS ACTUAL CURRENT DRAW OF EQUIPMENT

Most electrical tools, appliances and audio/video equipment have labels that indicate the power consumption in amps or watts. Be sure that the power consumption of the item you wish to operate is rated at 175/250/400 watts or less. (If the power consumption is rated in amps AC, simply multiply by the AC volts (230) to determine the wattage). The inverter has overload protection, so it is safe to try to operate equipment rated at 175/250/400 watts or less. The inverter will shut down if it is overloaded. The overload must be removed before the inverter will restart. Resistive loads are the easiest for the inverter to run. However, larger resistive loads, such as electric stoves or heaters, usually require more wattage than the inverter can deliver. Inductive loads, such as TV's and stereos, require more current to operate than do resistive loads of the same wattage rating. **Induction motors**, as well as **some televisions**, may require 2 to 6 times their wattage rating to start up. The most demanding in this category are those that start under load, such as compressors and pumps. Testing is the only definitive way to determine whether a specific load can be started and how long it can run. The unit will simply shut down if it is overloaded. To restart the unit after a shutdown due to overloading, remove the overload if necessary turn the power switch OFF then ON.

CAUTION: This inverter will not operate high wattage appliances or equipment that produce heat, such as hair dryers and ovens.

5.2 BATTERY OPERATING TIME

With a typical fully charged vehicle battery, a nominal operating time of 2 to 3 hours can be expected for 150watt output. In most instances, 5 to 10 hours of operating time is achievable for lower loading. However, SAMLEX recommends that the operator start the vehicle every 2 to 3 hours to recharge the battery system. This will guard against any unexpected shut-down of the equipment and will ensure that there is always sufficient battery capacity to start the vehicle's engine. The inverter will sound its alarm when DC voltage drops to 10.6 volt.

The inverter may be used whether or not the vehicle's engine is running. However, the inverter may not operate while the engine is starting since the battery voltage can drop substantially during cranking.

The inverter draws less than 0.4 ampere from the battery when it is not supplying power to a load and power switch is in the ON position. In most instances, the inverter can be left connected to the battery when not in use, make sure power switch is in the OFF position. However if the vehicle is to remain unused for several days, disconnect the inverter from the battery.

6. PROTECTIVE FEATURES OF THE INVERTER



Your inverter monitors the following potentially hazardous conditions:

OVER TEMPERATURE PROTECTION – If the temperature inside the inverter is too high, the unit will automatically shut down. Allow the unit to cool for at least 15 minutes before restarting after a heat-related shutdown. Unplug unit while cooling.

LOW BATTERY VOLTAGE PROTECTION - This condition is not harmful to the inverter but could damage the power source. The inverter automatically shuts down when input voltage drops to 10.0 volts. When the condition is corrected, the unit may be restarted.

OVER VOLTAGE PROTECTION – The inverter will automatically shut down when the input voltage exceeds 15.5 volts DC. Input voltage exceeds 16 volts could damage the inverter.

OVERLOAD PROTECTION – The inverter will automatically shut down when the continuous draw exceeds rated watts, and the inverter will auto reset.

SHORT CIRCUIT PROTECTION – The inverter will shut down. Remove the short circuit and the inverter will auto reset.

EARTH FAULT PROTECTION – This inverter comply with the standard current leakage allowance. When large current leakage to earth terminal occurs, the protection circuit activated and shut down the inverter, which prevent electric shock to human. Turn OFF the inverter, unplug the fault AC appliance and then turn ON is the only way to restart it.

LOW BATTERY ALARM – An alarm will sound when the voltage from the battery drops to 10.6 volts. This is an indication that the battery needs to be recharged. The user should stop operation of the electronic device at this time since the inverter will shut down automatically shortly thereafter, when the battery voltage drops to 10 volts. Start your engine to recharge the battery.

If the low voltage alarm sounds when the battery is fully charged, follow the steps for solving lack of output power in the Troubleshooting guide. The alarm will sound when the inverter is overloaded, in thermal shutdown, or if there is an excessive voltage drop between the battery and inverter.

NOTE: It is normal for the alarm to sound while the unit is being connected to, or disconnected from, the power source. This is not indicative of a problem.

7. COMMON PROBLEMS

"BUZZING" SOUND IN AUDIO SYSTEMS:

Some inexpensive stereo systems and "boom boxes" emit a buzzing sound from their speakers when operated from the power inverter. This occurs because the power supply in the electronic device does not adequately filter the modified sine wave produced by the inverter. The only solution to this problem is to use a higher quality sound system that incorporates a higher quality power amplified supply.

TELEVISION INTERFERENCE:

The inverter is shielded to minimize interference with TV signals. However, in some instances, some interference may still be visible, particularly with weak TV signals. Try the following corrective measures:

- Position the inverter as far as possible from the television, the antenna and the antenna cables. Use an extension cable, if necessary.
- Adjust the orientation of the inverter, the antenna cables and the TV power cord to minimize interference.
- Make sure that the antenna feeding the television provides an adequate ("snow free") signal and that high quality, shielded antenna cable is used.



By the advanced technology of SAMLEX, L.I.T greatly reduces the possibility of interference with TV signals and audios.

8. TROUBLESHOOTING GUIDE

TABLE 1 – INVERTER POWER SWITCH TURNED ON

| TROUBLE/ INDICATION | POSSIBLE CAUSE | SUGGESTED REMEDY |
|--|---|--|
| No AC output; Red LED lit Green LED not lit | DC input below 10 volts | Recharge or replace battery |
| | Inverter overheat → thermal shutdown | Remove or reduce load, wait for inverter to cool. |
| No AC output; Red & Green LED not lit | Inverter fuses open | Contact technical support |
| Non-continuous AC output; Red LED lit on & off Green LED lit | Inverter output power limited by overload / short circuit protection circuit | Reduce load or remove short circuit. |
| No AC output (latch up); Red LED lit Green LED lit | Earth fault protection is activated by excessive current leakage from the load. | Unplug the faulted load. |
| Low battery alarm sounds abnormal | Bad connection or wiring | Tighten all DC connections |
| Low battery alarm sounds | Low battery voltage | Recharge or replace battery |
| Motorized power tool won't start | Excessive start-up load | If appliance does not start, then appliance is drawing excessive wattage and will not work with inverter |
| Motorized power tool does not operate at correct speed | Purely inductive load | Make the load not purely inductive. Operate an incandescent lamp at same time as motor |
| TV/ Radio interference; Snow in picture, buzz in speaker | Appliance too close to inverter | Keep inverter and antenna distant from each other. Use shielded antenna cable. Connect antenna with amplifier. |

9 · FUSE REPLACEMENT

This inverter is protected by our integral electronic circuit and will automatically reset.

More than that, this inverter is equipped with a fuse that is located inside the inverter. Normally, this fuse will not blow unless there is a serious problem occurs. **Please DO NOT replace the fuse yourself**, we recommend you contact technician to find and fix the problems. **High voltage and high temperature inside!**

CAUTION: NO USER-SERVICEABLE COMPONENTS INSIDE. DO NOT ATTEMPT TO OPEN THE INVERTER.

10. SPECIFICATIONS

| | |
|--|-------------------------------|
| Output Connection..... | One Universal AC Receptacle |
| Output Voltage..... | Approx 230 volt AC RMS 50 Hz |
| Output Waveform..... | Modified Sine Wave (filtered) |
| Max. Efficiency..... | Approximately 90% |
| Input Voltage Range..... | 10.5 to 15.5 volt DC |
| Low Voltage Alarm..... | 10.6 volt DC |
| Low Voltage Shutdown..... | 10.0 volt DC |
| No Load Input Current (switch on)..... | 0.4 amps |
| Input Fuse..... | Internal |

Thank you for using SAMLEX power inverter!

Please feel free to let us know your comment

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